

CLAIMS

1. An apparatus for imparting motion from at least one of a plurality of motion sources into linear, rotary, or combined linear and rotary motion of an elongated device, the apparatus comprising:
 - 5 a transmission for translating the motion to linear or rotary motion of the elongated device.
2. The apparatus of claim 1 where the external motion source is a motor.
3. The apparatus of claim 2 further comprising:
 - 10 a controller electrically connected via drive circuitry to the motor and receiving positioning commands from an individual or machine;
 - a position feedback sensor measuring movement of the drive mechanism;
 - wherein motion of the elongated device is controlled by a closed control loop comprising the controller driving the motor and the
 - 15 sensor providing feedback about the elongated device motion to the controller.
4. The apparatus of claim 1 wherein the elongated device is a medical device.
5. The apparatus of claim 1 wherein the elongated device is a guide wire.
- 20 6. The apparatus of claim 1 wherein the elongated device is a catheter.
7. A transmission apparatus for imparting linear, rotary, or combined linear and rotary motion to an elongated device, the apparatus comprising:
 - a first main gear rotationally attached to a support and capable of being driven by a first drive;
 - 25 a second main gear coaxially and rotationally attached to the first main gear, the second main gear geared to a roller drive gear and

capable of being driven by a second drive;

- 5 a linear drive in which the elongated device may be engaged along an axis of the elongated device's rotation, the linear drive coupled to the first main gear, such that when the first main gear is rotated, the elongated device is rotated about the the elongated device's axis of rotation, the linear drive being geared to the roller drive gear, such that when the second main gear is rotated the linear drive imparts linear motion to the elongated device.

8. The apparatus of claim 7, wherein the first drive and the second drive transmit power to the first main gear and the second main gear respectively via drive screws.
- 5 9. The apparatus of claim 7, wherein the first drive and the second drive are motors.
10. The apparatus of claim 7, wherein the first main gear and the second main gear are each provided with a slot to enable lateral insertion or removal of the elongated device.
- 10 11. The apparatus of claim 10, wherein the first drive and the second drive are provided with a position tracking mechanism so as to allow automated alignment of the slots for insertion or removal of the elongated device.
12. The apparatus of claim 7, wherein the linear drive comprises two geared rollers that are geared to the second main gear.
- 15 13. The apparatus of claim 12, wherein the two geared rollers resiliently grip the elongated device, and may be separated in order to insert or remove the elongated device.
- 20 14. The apparatus of claim 7, wherein a first position sensor measures the position of the first drive and a second position sensor measures the position of the second drive, whereby an open control loop can be applied to the operation of the first and second drives.
- 25 15. The apparatus of claim 13, wherein the two geared rollers are connected to a linear position sensor, whereby the actual movement of the elongated device is measured, whereby a closed control loop comprising the actual position of the elongated device from the linear position sensor and the first and second drive positions from the first and second position sensors.
16. The apparatus of claim 7 wherein the elongated device is a medical device.
17. The apparatus of claim 7 wherein the elongated device is a guide wire.

18. The apparatus of claim 7 wherein the elongated device is a catheter.

19. A transmission apparatus for imparting linear, rotary, or combined linear and rotary motion to an elongated device, the apparatus comprising:

5 a main gear rotationally attached to a support and capable of being driven by a first drive;

 a linear drive in which the elongated device may be engaged along an axis of the elongated device's rotation, the linear drive coupled to the first main gear, such that when the first main gear is rotated, the elongated device is rotated about the the elongated device's axis of rotation, the linear drive being geared to a second drive to impart
10 linear motion to the elongated device.

20. The apparatus of claim 19, wherein the first drive and the second drive are motors.
21. The apparatus of claim 19, wherein the main gear is provided with a slot to enable lateral insertion or removal of the elongated device.
- 5 22. The apparatus of claim 21, wherein the first drive and the second drive are provided with a position tracking mechanism so as to allow automated alignment of the slot and the linear drive for insertion or removal of the elongated device.
- 10 23. The apparatus of claim 19, wherein the linear drive comprises two geared rollers.
24. The apparatus of claim 23, wherein the two geared rollers resiliently grip the elongated device, and may be separated in order to insert or remove the elongated device.
- 15 25. The apparatus of claim 19, wherein a first position sensor measures the position of the first drive and a second position sensor measures the position of the second drive, whereby an open control loop can be applied to the operation of the first and second drives.
- 20 26. The apparatus of claims 24 and 25, wherein the two geared rollers are connected to a linear position sensor, whereby the actual movement of the elongated device is measured, whereby a closed control loop comprising the actual position of the elongated device from the linear position sensor and the first and second drive positions from the first and second position sensors.
- 25 27. The apparatus of claim 19 wherein the first drive comprises a motor that imparts rotational force to a first drive roller that both imparts rotational force to the main gear and imparts rotational force via a translation roller to a second drive roller that also imparts force to the main gear.
28. The apparatus of claim 19 wherein the second drive is a motor that is driven by an internal source and controlled via wireless means.

29. The apparatus of claim 19 wherein the second drive is a that is driven by power from a coil on the main gear that is in contact with brushes on the base.

5 30. The apparatus of claim 19 wherein the elongated device is a medical device.

31. The apparatus of claim 19 wherein the elongated device is a guide wire.

32. The apparatus of claim 19 wherein the elongated device is a catheter.

33. A method for imparting linear, rotary, or combined linear and rotary motion to an elongated device, the method comprising:

10 rotating a first main gear rotationally attached to a support and capable of being driven by a first drive;

rotating a second main gear coaxially and rotationally attached to the first main gear, the second main gear geared to a roller drive gear and capable of being driven by a second drive;

15 engaging the elongated device along an axis of the elongated device's rotation in a linear drive, the linear drive coupled to the first main gear, such that when the first main gear is rotated, the elongated device is rotated about the elongated device's axis of rotation, the linear drive being geared to the roller drive gear, such
20 that when the second main gear is rotated the linear drive imparts linear motion to the elongated device.

34. A method for imparting linear, rotary, or combined linear and rotary motion to an elongated device, the method comprising:

25 rotating a main gear rotationally attached to a support and capable of being driven by a first drive;

engaging the elongated device along an axis of the elongated device's rotation in a linear drive, the linear drive coupled to the main gear, such that when the main gear is rotated, the elongated device is rotated about the elongated device's axis of rotation, the linear drive being geared to a

second drive, such that the linear drive imparts linear motion to the elongated device.